REMARKS

This Amendment is in response to the Office Action mailed September 13, 2001. In the Office Action, claims 2-6 and 20-24 have been allowed, but claims 8-18 were rejected under 35 U.S.C. §103(a). In response, Applicant has (i) cancelled claims 10 and 18, without prejudice, and (ii) amended claims 12 and 13 to include limitations from recently allowed claim 20. Applicant respectfully requests the Examiner to reconsider allowance of claims 12 and 13 as well as those claims depending on them.

I.   REJECTION UNDER 35 U.S.C. § 103(a)

Claims 12 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,311,588 issued to Polcyn, et al. (Polcyn) in view of U.S. Patent No. 5,664,052 issued to Nishiguchi, et al. (Nishiguchi). Applicant traverses the rejection but further discussion of the rejection is moot in light of the amendments set forth above. Applicant respectfully requests the Examiner to allow all pending claims.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

1   2.   (Amended) The method of claim 6, wherein prior to determining the peak-to-

2   mean likelihood ratio, the method further comprises:

3   determining a short-term averaged energy for the current audio frame; and

4   determining a long-term averaged energy for the current audio frame.

1   3.   The method of claim 2, wherein after determining the short-term averaged

2   energy and the long-term averaged energy, the method further comprises:

3   determining whether a sum of the short-term averaged energy and a factor is greater

4   than the long-term averaged energy; and

5   determining that the current audio frame represents silence if the sum is less than the

6   long-term averaged energy, without necessitating a determination of the peak-to-mean

7   likelihood ratio.

1   4.   The method of claim 3, upon determining that the sum is greater than the

2   long-term averaged energy and before determining the peak-to-mean likelihood ratio, the

3   method further comprises:

4   determining whether a difference between the long-term averaged energy and the

5   short-term averaged energy is less than a predetermined threshold;

6   determining that the current audio frame represents voice if the difference is greater

7   than the predetermined threshold; and

8   continuing by determining the peak-to-mean likelihood ratio if the difference is less

9   than the predetermined threshold.

1   5.   The method of claim 2, wherein the determining of the short-term averaged

2   energy comprises:

3   determining an energy, in decibels, of the current audio frame;

4   determining a short-term averaged energy for a prior audio frame; and

5   conducting a weighted average of the energy of the current audio frame and the short-

6   term averaged energy for the prior audio frame.

1   6.   (Twice Amended)   A method for enhancing voice activity detection

2   comprising:

3   determining a peak-to-mean likelihood ratio, the determining a peak-to-mean

4   likelihood ratio comprises

5   calculating an averaged peak-to-mean ratio for the current audio frame,

6   determining a maximum averaged peak-to-mean ratio,

7   determining a minimum averaged peak-to-mean ratio,

8   determining a difference between the maximum averaged peak-to-mean ratio

9   and the averaged peak-to-mean ratio for the current audio frame,

10   determining a difference between the maximum averaged peak-to-mean ratio

11   and the minimum averaged peak-to-mean ratio, and

12   conducting a ratio, a denominator of the ratio being the difference between the

13   maximum averaged peak-to-mean ratio and the minimum averaged peak-to-mean

14   ratio, the numerator being the difference between the maximum averaged peak-to-

15   mean ratio and the averaged peak-to-mean ratio; and

16   comparing the peak-to-mean likelihood ratio to a selected threshold to determine

17   whether a current audio frame represents a voice signal.

1   8.   (Amended) The communication module of claim 12 , wherein the voice

2   activity detector, when executed, controls the processing unit to determine whether a sum of

3   the short-term averaged energy and a predetermined factor is greater than the long-term

4   averaged energy, and to signal that the current audio frame represents silence if the sum is

5   less than the long-term averaged energy.

1   9.   The communication module of claim 8, wherein the voice activity detector,

2   when executed, controls the processing unit to determine whether a difference between the

3   long-term averaged energy and the short-term averaged energy is less than a predetermined

4   threshold, and to signal that the current audio frame represents voice if the difference is

5   greater than the predetermined threshold.

1   10.   (Cancelled)

1   11.   (Amended) The communication module of claim [10] 9, wherein the voice

2   activity detector, when executed, controls the processing unit to determine a peak-to-mean

3   ratio by (i) sampling an analog signal a predetermined number of times to produce a plurality

4   of sampled signals each having a sampled value, (ii) determining a maximum value of the

5   plurality of sampled signals, and (iii) conducting a ratio between an absolute value of the

6   maximum value and a summation of the sampled values for the plurality of sampled signals.

1   12.   (Twice Amended) A communication module comprising:

2   a substrate;

3   a processing unit placed on the substrate; and

4   a memory coupled to the processing unit, the memory to contain a voice activity

5   detector which, when executed, controls the processing unit to

6   determine [an averaged peak-to-mean ratio] a peak-to-mean likelihood ratio

7   for the current audio frame by (i) monitoring a maximum averaged peak-to-mean

8   ratio and a minimum averaged peak-to-mean ratio, (ii) determining a first result being

9   a difference between the maximum averaged peak-to-mean ratio and the averaged

10   peak-to-mean ratio for the current audio frame, (iii) determining a second result being

11   a difference between the maximum averaged peak-to-mean ratio and the minimum

12   averaged peak-to-mean ratio, and (iv) conducting a ratio between the first result as a

13   numerator and the second result [to produce the peak-to-mean likelihood ratio] as a

14   denominator; and

15   compare the peak-to-mean likelihood ration to a selected threshold to

16   determine whether the current audio frame represents a voice signal.

1   13.   (Twice Amended)   A machine readable medium having embodied thereon

2   a computer program for processing by a machine, the computer program comprising:

3   a first routine for determining a normalized peak-to-mean likelihood ratio including

4   (i) a denominator having a value substantially equal to a difference between a maximum

5   averaged peak-to-mean ratio and a minimum averaged peak-to-mean ratio and (ii) a

6   numerator having a value substantially equal to a difference between the maximum averaged

7   peak-to-mean ratio and the averaged peak-to-mean ratio; and

8   a second routine for comparing the peak-to-mean likelihood ratio to a selected

9   threshold to determine whether an audio frame being transmitted represents a voice signal.

1   14.   The machine readable medium of claim 13, wherein the computer program

2   further comprising:

3   a third routine for determining a short-term averaged energy for the audio frame, the

4   third routine being executed before the first and second routines; and

5   a fourth routine for determining a long-term averaged energy for the audio frame, the

6   fourth routine being executed before the first and second routines.

1   15.   The machine readable medium of claim 14, wherein the computer program

2   further comprising:

3   a fifth routine for determining whether a sum of the short-term averaged energy and a

4   predetermined factor is greater than the long-term averaged energy, the fifth routine being

5   executed before the first and second routines; and

6   a sixth routine for determining whether a difference between the long-term averaged

7   energy and the short-term averaged energy is less than a predetermined threshold, the sixth

8   routine being executed after determining that the sum is greater than the long-term averaged

9   energy and before execution of the first and second routines.

1   16.   The machine readable medium of claim 15, wherein the fifth routine

2   determining that the current audio frame represents silence if the sum is less than the long-

3   term averaged energy.

1   17.   The machine readable medium of claim 15, wherein the sixth routine

2   determining that the current audio frame represents voice if the difference is greater than the

3   predetermined threshold.

1   18.   (Cancelled)

1   20.   A method for enhancing voice activity detection comprising:

2   determining a peak-to-mean likelihood ratio including (i) a denominator having a

3   value substantially equal to a difference between a maximum averaged peak-to-mean ratio

4   and a minimum averaged peak-to-mean ratio and (ii) a numerator having a value

5   substantially equal to a difference between the maximum averaged peak-to-mean ratio and

6   the averaged peak-to-mean ratio; and

7   comparing the peak-to-mean likelihood ratio to a selected threshold to determine

8   whether a current audio frame represents a voice signal.

1   21.   The method of claim 20, wherein prior to determining the peak-to-mean

2   likelihood ratio, the method further comprises:

3   determining a short-term averaged energy for the current audio frame; and

4   determining a long-term averaged energy for the current audio frame.

1   22.   The method of claim 21, wherein after determining the short-term averaged

2   energy and the long-term averaged energy, the method further comprises:

3   determining whether a sum of the short-term averaged energy and a factor is greater

4   than the long-term averaged energy; and

5   determining that the current audio frame represents silence if the sum is less than the

6   long-term averaged energy, without necessitating a determination of the peak-to-mean

7   likelihood ratio.

1   23.   The method of claim 22, upon determining that the sum is greater than the

2   long-term averaged energy and before determining the peak-to-mean likelihood ratio, the

3   method further comprises:

4   determining whether a difference between the long-term averaged energy and the

5   short-term averaged energy is less than a predetermined threshold;

6   determining that the current audio frame represents voice if the difference is greater

7   than the predetermined threshold; and

8   continuing by determining the peak-to-mean likelihood ratio if the difference is less

9   than the predetermined threshold.

1   24.   The method of claim 21, wherein the determining of the short-term averaged

2   energy comprises:

3   determining an energy, in decibels, of the current audio frame;

4   determining a short-term averaged energy for a prior audio frame; and

5   conducting a weighted average of the energy of the current audio frame and the short-
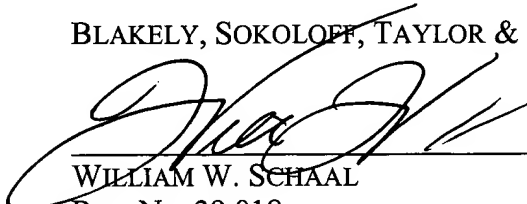
6   term averaged energy for the prior audio frame.

CONCLUSION

In view of the amendments and remarks made above, it is respectfully submitted that

all pending claims are in condition for allowance, and such action is respectfully solicited.

Respectfully submitted,
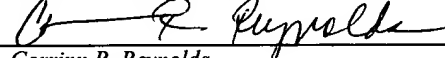
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